Application Serial No: 10/712,770
Responsive to the Office Action mailed on: December 17, 2007

IN THE CLAIMS

Amendments To The Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-2. (Cancelled)

3. (Currently Amended) A solid-state image sensing device, comprising:

vertical transfer parts provided corresponding to respective columns of bidimensionally arranged pixels to vertically transfer signal charges read out from the pixels; and

a horizontal transfer part for horizontally transferring the signal charges received from the vertical transfer parts,

wherein the vertical transfer parts include transfer stages, those located closest to the horizontal transfer part being vertical last stages, and the vertical last stages have transfer electrodes formed to have identical configurations repeated every m (m denotes an integer of 2 or higher) columns,

vertical last stages of columns other than one of the m columns or all vertical last stages of the m columns each are provided with a transfer electrode that is independent of those of other vertical last stages of the m columns so that an operation of transferring signal charges from the vertical last stages concerned to the horizontal transfer part is controlled independently of said other vertical last stages,

the integer m is 2n+1 (n denotes an integer of 1 or higher), and

signal charges of pixels included in each of first and second pixel mixture groups are added together in the horizontal transfer part,

where the first pixel mixture groups each are composed of 2n+1 (n denotes an integer of 1 or higher) pixels arranged at every other pixel in a horizontal direction of the bidimensionally arranged pixels, and

the second pixel mixture groups each are composed of 2n+1 pixels that are arranged at every other pixel and are pixels other than those of the first pixel mixture groups in the horizontal direction of the bidimensionally arranged pixels, with centers of gravity of the pixels of the respective second pixel mixture groups each being located at an equal distance from centers of gravity of the pixels of two first pixel mixture groups adjacent thereto.

4. (Original) The solid-state image sensing device according to claim 3, wherein with respect to each of the first and second pixel mixture groups present in the vertical last stages,

(a1) only signal charges of pixels located furthest from an output side of the horizontal transfer part in the respective pixel mixture groups each composed of the 2n+1 pixels are transferred from the vertical last stages to the horizontal transfer part,

(a2) the signal charges present in the horizontal transfer part are transferred in a forward direction by a distance corresponding to two pixels,

(a3) only signal charges of pixels that have signal charges remaining in the vertical last stages and are located furthest from the output side of the horizontal transfer part in the respective pixel mixture groups each composed of the 2n+1 pixels are transferred from the vertical last stages to the horizontal transfer part, and

(a4) transfer operations a2 and a3 are repeated until all signal charges of the pixel mixture groups each composed of 2n+1 pixels are transferred from the vertical last stages to the horizontal transfer part.

5. (Original) The solid-state image sensing device according to claim 4, wherein further

(b1) as the last operation of transfer operations a1 to a4, signal charges present in the vertical transfer parts of all the columns are transferred to respective next stages after or at the same time a signal charge of the last pixel included in each of the pixel mixture groups each composed of 2n+1 pixels is transferred from the vertical last stage to the horizontal transfer part,

(b2) with respect to signal charges transferred to the vertical last stages by transfer operation b1, the transfer operations a1 to a4 are carried out, and

(b3) transfer operations b1 and b2 are repeated until signal charges included in 2n+1 stages are transferred to the horizontal transfer part.

6. (Previously Presented) The solid-state image sensing device according to claim 3, wherein the vertical last stages located closest to the horizontal transfer part of the vertical transfer parts have transfer electrodes formed to have identical configurations repeated every three columns, and

vertical last stages of at least the second and third columns of the three columns, counted as from an output side of the horizontal transfer part, each are provided with a transfer electrode that is independent of those of the other vertical last stages so that an operation of transferring signal charges from the respective vertical last stages concerned to the horizontal transfer part is controlled independently of the other vertical last stages.

7. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of the first column counted as from the output side of the horizontal transfer part has an electrode configuration that is identical to those of stages other than the vertical last stage of the first column.

8. (Original) The solid-state image sensing device according to claim 6, wherein first pixel mixture groups each are composed of three pixels arranged at every other pixel in a horizontal direction, and

second pixel mixture groups each are composed of three pixels that are arranged at every other pixel and are pixels other than those of the first pixel mixture groups, with centers of gravity of the pixels of the respective second pixel mixture groups each being located at an equal distance from centers of gravity of the pixels of two first pixel mixture groups adjacent thereto.

9. (Original) The solid-state image sensing device according to claim 6, wherein

(c1) only a signal charge of the vertical last stage of the second column of the three columns, counted as from the output side of the horizontal transfer part, is transferred to the horizontal transfer part,

(c2) signal charges present in the horizontal transfer part are transferred in a forward direction by a distance corresponding to two pixels,

(c3) only a signal charge of the vertical last stage of the third column of the three columns, counted as from the output side of the horizontal transfer part, is transferred to the horizontal transfer part,

(c4) signal charges present in the horizontal transfer part are transferred in the forward direction by the distance corresponding to two pixels, and

(c5) a signal charge of the vertical last stage of the first column of the three columns, counted as from the output side of the horizontal transfer part, is transferred to the horizontal transfer part.

10. (Original) The solid-state image sensing device according to claim 9, wherein

(d1) signal charges present in the vertical transfer parts of all the columns are transferred to respective next stages after or at the same time the signal charge of the vertical last stage of the first column is transferred to the horizontal transfer part by transfer operation c5,

(d2) with respect to signal charges transferred to the vertical last stages in the end of transfer operation d1, transfer operations c1 to c5 are carried out, and signal charges present in the vertical transfer parts of all the columns are transferred to respective next stages after or at the same time the signal charge of the vertical last stage of the first column is transferred to the horizontal transfer part by transfer operation c5, and

(d3) transfer operations c1 to c5 are carried out with respect to signal charges transferred to the vertical last stages in the end of transfer operation d2.

11. (Original) The solid-state image sensing device according to claim 3, wherein one pixel mixture group is composed of (2n+1).times.(2n+1) pixels that are those of either the first or the second pixel mixture groups each including 2n+1 pixels present in 2n+1 rows located at every other row in a vertical direction, and signal charges of the pixels arranged in the 2n+1 rows of each of the columns are added together in the respective vertical transfer parts.

12. (Original) The solid-state image sensing device according to claim 11, wherein the one pixel mixture group is composed of nine pixels arranged in three rows located at every other row in the vertical direction, with three pixels arranged at every other pixel in the horizontal direction being included in each of the three rows.

13. (Original) The solid-state image sensing device according to claim 3, wherein one pixel mixture group is composed of six pixels arranged in two rows located with three rows being present therebetween in the vertical direction, with three pixels arranged at every other pixel in the horizontal direction being included in each of the two rows.

14. (Original) The solid-state image sensing device according to claim 3, wherein one pixel mixture group is composed of three pixels arranged at every other pixel in the horizontal direction in each of rows located at every three rows in the vertical direction.

15. (Previously Presented) The solid-state image sensing device according to claim 3, wherein the bidimensionally arranged pixels are provided with color filters arranged so that four pixels of (two pixels arranged horizontally).times.(two pixels arranged vertically) form one unit.

16. (Original) The solid-state image sensing device according to claim 15, wherein the color filters are arranged so that a first color filter is provided for two pixels, of the four pixels, located on one diagonal line, and second and third color filters are provided for the other two pixels, respectively.

17. (Cancelled)

18. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of each column is formed with six transfer electrodes, and

in all vertical transfer parts of three columns adjoining each other, among the six transfer electrodes, those located second and fourth from a side of the horizontal transfer part are independent electrodes that are independent of those of vertical last stages of the

other columns, and those located first, third, fifth, and sixth are electrodes common to the other stages of the respective vertical transfer parts.

19. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of each column is formed with six transfer electrodes,

in vertical transfer parts of two of three columns adjoining each other, among the six transfer electrodes, those located second and fourth from a side of the horizontal transfer part are independent electrodes that are independent of those of vertical last stages of the other columns and those located first, third, fifth, and sixth are electrodes common to the other stages of the respective vertical transfer parts, and

in a vertical transfer part of remaining one of the three columns adjoining each other, all the six transfer electrodes located first to sixth are electrodes common to the other stages of the vertical transfer part concerned.

20. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of each column is formed with six transfer electrodes, and

in all vertical transfer parts of three columns adjoining each other, among the six transfer electrodes, those located second, fourth, and sixth from a side of the horizontal transfer part are independent electrodes that are independent of those of vertical last stages of the other columns, and those located first, third, and fifth are electrodes common to the other stages of the respective vertical transfer parts.

21. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of each column is formed with six transfer electrodes,

in vertical transfer parts of two of three columns adjoining each other, among the six transfer electrodes, those located second, fourth, and sixth from a side of the horizontal transfer part are independent electrodes that are independent of those of vertical last stages of the other columns and those located first, third, and fifth are electrodes common to the other stages of the respective vertical transfer parts, and

in a vertical transfer part of a remaining one of the three columns adjoining each other, all the six transfer electrodes located first to sixth are electrodes common to the

other stages of the vertical transfer part concerned.

22. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of each column is formed with six transfer electrodes, and

in vertical transfer parts of at least two of three columns adjoining each other, among the six transfer electrodes, those located second and fourth from a side of the horizontal transfer part are independent electrodes that are independent of those of vertical last stages of the other columns, and in vertical transfer parts of all the three columns adjoining each other, those located first and third from the side of the horizontal transfer part are different electrodes from those provided in the other stages of the respective vertical transfer parts.

23. (Original) The solid-state image sensing device according to claim 6, wherein a vertical last stage of each column is formed with six transfer electrodes, and

in vertical transfer parts of at least two of three columns adjoining each other, among the six transfer electrodes, those located second, fourth, and sixth from a side of the horizontal transfer part are independent electrodes that are independent of those of vertical last stages of the other columns, and in vertical transfer parts of all the three columns adjoining each other, those located first, third, and fifth from the side of the horizontal transfer part are different electrodes from those provided in the other stages of the respective vertical transfer parts.

24. (Previously Presented) The solid-state image sensing device according to claim 3, wherein each stage of the vertical transfer parts is formed with six transfer electrodes, and in transfer stages other than the vertical last stage of each of the vertical transfer parts, the transfer electrodes located second, fourth, and sixth from a side of the horizontal transfer part each are formed of an electrode film of a first layer, as an electrode common to all columns, and the transfer electrodes located first, third, and fifth from the side of the horizontal transfer part each are formed of an electrode film of a second layer as an electrode common to all the columns, the second layer being an upper layer formed above the first layer, and

in the respective vertical last stages, the electrodes located second and fourth from the side of the horizontal transfer part each are formed, as an independent electrode, of an electrode film identical to that of the second layer that is divided into insular parts located corresponding to the respective columns.

Claims 25-28. (Cancelled)

29. (Currently Amended) A solid-state image sensing device, comprising:

vertical transfer parts provided corresponding to respective columns of bidimensionally arranged pixels to vertically transfer signal charges read out from the pixels; and

a horizontal transfer part for horizontally transferring the signal charges received from the vertical transfer parts,

wherein the vertical transfer parts include transfer stages, those located closest to the horizontal transfer part being vertical last stages, and the vertical last stages have transfer electrodes formed to have identical configurations repeated every m (m denotes an integer of 2 or higher) columns,

vertical last stages of columns other than one of the m columns or all vertical last stages of the m columns each are provided with a transfer electrode that is independent of those of other vertical last stages of the m columns so that an operation of transferring signal charges from the vertical last stages concerned to the horizontal transfer part is controlled independently of said other vertical last stages, and

the integer m indicates a common multiple of m_1 (m_1 denotes an integer of 2 or higher) and m_2 (m_2 denotes an integer of 2 or higher), and its operation mode can be switched selectively between at least two modes including a mode of mixing m_1 pixels arranged horizontally of the bidimensionally arranged pixels and a mode of mixing m_2 pixels arranged horizontally of the bidimensionally arranged pixels.

30. (Original) The solid-state image sensing device according to claim 29, further comprising color filters of three colors arranged in a repeated pattern in which among the color filters, those of two out of the three colors are arranged vertically and those of two

out of the three colors are arranged horizontally, wherein the operation mode can be switched selectively between at least two modes including a mode of mixing m_1 pixels arranged horizontally and a mode of mixing m_2 pixels arranged horizontally, with the m_1 pixels and m_2 pixels being provided with filters having one of the three colors of the color filters, respectively.

31. (Original) The solid -state image sensing device according to claim 29, further comprising color filters of three colors arranged in a repeated pattern in which among the color filters, those of two out of the three colors are arranged vertically and those of two out of the three colors are arranged horizontally, wherein the operation mode can be switched selectively between at least two modes selected from a mode of mixing two pixels arranged horizontally, a mode of mixing three pixels arranged horizontally, and a mode of mixing four pixels arranged horizontally, with the two, three, and four pixels being provided with filters having one of the three colors of the color filters, respectively.

32. (Original) The solid -state image sensing device according to claim 29, wherein a mode of mixing no pixels further is included as the operation mode.

Claims 33-35. (Cancelled)

36. (Previously Presented) A camera, comprising a solid-state image sensing device according to claim 3.

Claims 37 and 38. (Cancelled)